

# **NOTICE**

**All drawings located at the end of the document.**

**NO FURTHER ACCELERATED ACTION JUSTIFICATION FOR RETENTION  
POND C-1**

**PAC REFERENCE NUMBER: SE-142.10**

IHSS Reference Number                      SE-142 10  
Unit Name                                      Retention Pond C-1  
Approximate Location                      N747,000, E2,088,000

Date(s) of Operation or Occurrence

1955 - Present

Description of Operation or Occurrence

IHSS 142 10 (Pond C-1) at the Rocky Flats Environmental Technology Site (RFETS) was constructed in 1955 to provide temporary holding and monitoring of Woman Creek waters including discharge from Ponds 6, 7, and 8 (Pond C-1 was also referred to as Pond 9 prior to the early 1970s) The first discharge from Pond C-1 was observed on March 29, 1955 Figure 1 shows the location of Pond C-1 (IHSS 142 10) at the RFETS

Ponds 6, 7, and 8 were located adjacent to Woman Creek upstream from Pond C-1 Pond 6 (PAC SW-196) received water treatment plant backwash, Pond 7 (PAC SE-1600) received steam condensate from the Building 881 cooling towers and could have received sewage lift station overflows, and Pond 8 (PAC SE-1601) probably received Building 881 cooling tower overflow/blowdown See Historical Release Report descriptions for PAC SW-196, PAC SE-1600, PAC SE-1601 1, and PAC SE-1601 2 for a more complete discussion of these ponds (DOE 1992) It is believed that Pond 6 was a multi-purpose pond, with the following materials being placed in the pond in October 1954 ashes from the plant incinerator, graphite, used caustic drums, and general trash Pond 6 is currently filled in and is located within the boundaries of the Original Landfill Pond 6 is being addressed as part of the Original Landfill Interim Measure/Interim Remedial Action Ponds 7 and 8 (PACs SE-1600 and -1601) were approved for No Further Accelerated Action in 2002 Ponds 6, 7, and 8 are no longer in existence and never received an alpha-numeric designation like Pond 9 (now Pond C-1) The numeric pond numbering system at the RFETS was replaced by an alpha-numeric system in the early 1970s

The South Interceptor Ditch was constructed in 1979 in order to re-route runoff from the southern portions of the RFETS main manufacturing area to Pond C-2 (IHSS 142 11) Water from the South Interceptor Ditch is the only input to Pond C-2, allowing Pond C-2 to serve as a surface water retention and spill control pond Woman Creek flow enters Pond C-1, which serves as a flow-through



ADMIN RECORD

IA-A-002126

temporary detention pond Discharges from Pond C-1 are routed around Pond C-2 and back into the natural Woman Creek channel (DOE 1992)

Problems or releases that are known to have occurred in Woman Creek as summarized in the Historical Release Report (DOE 1992) are listed below

- Sanitary sewer overflow and discharge of untreated sanitary sewage were released to Woman Creek Discharges ceased on February 21, 1955
- A release of 2,700 gallons of steam condensate from Building 881 to Pond 7 occurred due to a break in the process waste line leading to Building 774 The break occurred on September 27, 1955
- Pond C-1, the drainage, and the general area near Pond C-1 (and Pond C-2) are believed to have been impacted by re-suspended soil and runoff from the 903 Pad area (PAC 900-112 and PAC 900-155)
- An armored vehicle turned over into Woman Creek upstream of Pond C-1 on October 19, 1975 (PAC SW-1700) An oil slick was observed on the C-series drainage west of the clay pits during the week of October 20, 1975 This oil slick was not observed at Pond C-1 nor where the C-Series drainage passed beneath Indiana Street The source of this oil slick is believed to be from the overturned vehicle (PAC SW-1700)
- Leakage from the South Interceptor Ditch to Woman Creek near the outfall of the Building 881 footing drain was observed during the week ending March 12, 1982 Repairs to the South Interceptor Ditch were requested It is unknown if repairs were made at that time, however, it is known that sloughing in the Building 881 area of the ditch had greatly reduced its capacity, and accordingly, temporary sandbags were placed along the embankments in the early 90's to provide for additional capacity

#### Physical/Chemical Description of Constituents Released

Monitoring of effluents discharged offsite from the Woman Creek drainage has routinely taken place since the first discharge from Pond C-1 In 1955 these analyses consisted of daily composite samples for pH, nitrate, and radionuclide activity, with a detailed mineral analysis on a monthly composite More recently, the analytes that have been monitored in offsite discharges from the C-Series drainage have consisted of pH, nitrate as nitrogen, and nonvolatile suspended solids Pond C-1 sediments are known to contain low levels of plutonium, americium, and uranium contamination (DOE 1992)

Some data are available on the characteristics of the backwash and sludge blowdown waters from the water treatment plant. The 1953 data indicate that the water discharged from the water treatment plant was very turbid, slightly basic, and had a slightly higher concentration of dissolved chemicals than the raw water treated by the water treatment plant (DOE 1992).

#### Responses to Operation or Occurrence

Discharges of cooling tower wastes (Building 881 steam condensate and overflow/blowdown) to Woman Creek ceased when the RFP operators directed these flows to the sanitary wastewater treatment system. This re-routing of flows probably occurred in the mid-1970 (DOE 1992).

The water treatment plant backwash waters were discharged to the Woman Creek drainage until a sludge drying bed system was installed for these waters at the water treatment plant. This recycle system was probably installed sometime in the mid-1970s (DOE 1992).

#### Fate of Constituents Released to Environment

Pond C-1 has been characterized based on sediment data collected for the RCRA Facility Investigation/Remedial Investigation (RFI/RI) for the Woman Creek Priority Drainage (OU 5) (DOE 1996a), sediment data collected in accordance with the Sampling and Analysis Plan for Characterization of Pond C-1 (IHSS 142 10) (URS 2002)<sup>1</sup>, and surface water data collected by the Site operators from 1991 through 1996. Figure 2 shows the sampling locations, and Table 1 summarizes the sampling and analysis program. As can be seen, sediment samples were analyzed for metals, radionuclides, volatile organic compounds (VOCs), semivolatile organic compounds (SVOCs), pesticides, polychlorinated biphenyls (PCBs) and Water Quality Parameters (WQP), and surface water samples were analyzed for all analytical suites except PCBs. Although PCBs were not analyzed in surface water, PCBs are relatively insoluble, and there are no Rocky Flats Cleanup Agreement (RFCA) Attachment 5 Surface Water Action Levels (ALs) for PCBs (DOE et al. 2003). Surface water was sampled frequently between 1991 and 1996 for total radionuclides. In 1991, there were several samples collected for dissolved radionuclides, total and dissolved metals, as well as organics. Surface water sampling and analysis for Pond C-1 ceased after 1996 in accordance with the Integrated Monitoring Plan (DOE 1997).

The sediment and surface water data are summarized in Tables 2 and 3, respectively. These tables show analytes that were detected above background (see discussion below). In these tables, the following decision rules were applied to the calculation of summary statistics:

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<sup>1</sup> Samples (CR- series) were collected by URS to characterize the Pond C-1 sediments in the event that excavation and disposal of sediments were required for the final disposition of the pond. Samples were analyzed for radionuclides (gamma spectrometry) and metals (x-ray fluorescence [SW 846 Method 6200]).

- 1 Data rejected during validation was eliminated from the data set before computing statistics
- 2 The maximum value is the highest detected value observed
- 3 The average was computed using only data that are above background concentrations

Figures 3 and 4 show for sediment and surface water, respectively, all the data that were detected above background, and that have a RFCA AL [Wildlife Refuge Worker (WRW) soil/sediment AL or surface water AL] The ALs are from RFCA Attachment 5, dated June 5, 2003 (DOE et al 2003) Background levels for inorganic constituents for surface water and sediment are from the Background Geochemical Characterization Report (DOE 1993) All background values used for comparison are the mean background value plus two standard deviations Any detection of an organic compound is considered an above background level observation

### **SEDIMENT ASSESSMENT**

As shown in Table 2 and Figure 3, the sediments in Pond C-1 contain above background concentrations of several metals, radionuclides, and nitrite In addition, a few VOCs and SVOCs were detected The inorganic constituent concentrations, albeit above background levels, were of the same order of magnitude as the background levels Both the inorganic and organic constituent concentrations were well below the WRW ALs

### **APPLICATION OF THE SUBSURFACE SOIL RISK SCREEN**

#### **Screen 1 – Are Contaminant of Concern (COC) Concentrations Below RFCA Attachment 5 Table 3 Wildlife Refuge Worker (WRW) Soil Action Levels?**

Yes Subsurface soil does not exceed the WRW ALs (see Figure 3) In accordance with Figure 3 of RFCA Attachment 5, Screen 4 is performed next given a “yes” response to Screen 1

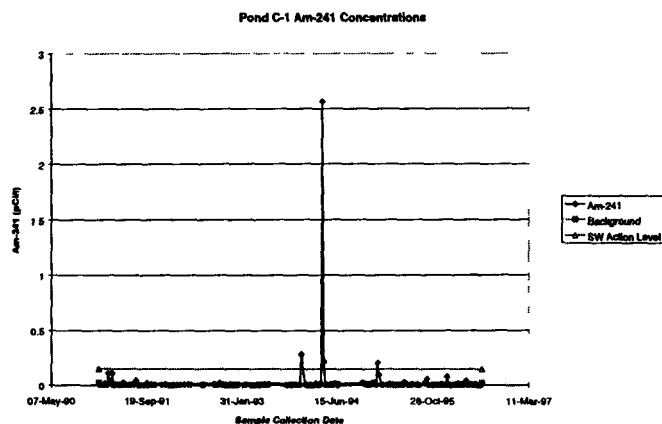
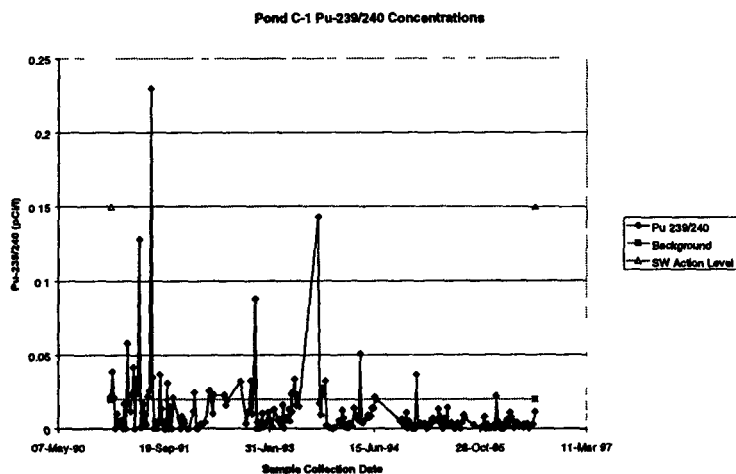
#### **Screen 4 – Is there an environmental pathway and sufficient quantity of COC that would cause exceedance of surface water standards (SWS)?**

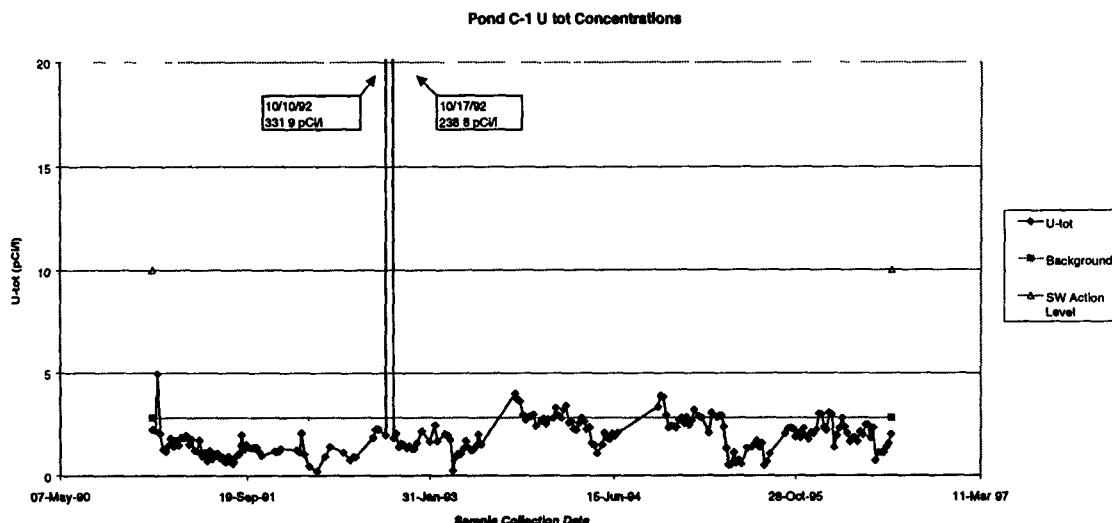
No Pond C-1 is a flow-through pond on Woman Creek, and therefore, erosion is a potentially significant pathway whereby surface water could become contaminated by the sediments However, the concentrations of the constituents above background in the sediment are relatively low (Table 2 and Figure 3) The few organic compounds that were detected at low levels in the sediment have never been detected in Pond C-1 surface water (compare Tables 2 and 3)

Although the focus of Screen 4 is soil contamination and its potential to impact surface water, because IHSS 142 10 contains surface water some of the time, the quality of the water was examined As shown in Figure 4, radionuclides and to a much lesser extent organics and nitrite have been detected above background levels in Pond C-1 water Of

the organics and nitrite, only methylene chloride was above the surface water AL. However, the two samples where methylene chloride was above the AL were the only detections of methylene chloride out of a total of 17 samples that were collected for VOC analysis (all of these samples were collected in 1991, and no additional samples have been collected since that time for VOC analysis). The concentrations were relatively low, and methylene chloride was detected in the laboratory blanks, i.e., the presence of methylene chloride in the surface water samples appears to be an artifact because this compound is a common laboratory contaminant.

With respect to the radionuclides, Table 3 and Figure 4 indicate plutonium-239,240, americium-241, and uranium-total concentrations have been above background in Pond C-1 surface water samples, and occasionally above the surface water ALs. However, as shown in the following concentration vs. time graphs, concentrations above the surface water ALs were very infrequent. Indeed, the data indicate that most of the radionuclide concentrations are below or slightly above the background levels. This indicates the water is rarely impacted, if it is impacted at all (see discussion below).





In the instances where radionuclide concentrations are above the surface water ALs, replicate data for these samples recorded in the Soil Water Database are at much lower concentrations below the surface water ALs (Table 4)<sup>2</sup> These replicate data are more representative of the balance of the data for these radionuclides in Pond C-1 surface water. Therefore, it is concluded that reported concentrations above the surface water ALs are spurious based on both the replicate data and the data as a whole.

As a final note regarding surface water quality, under RFCA, surface water compliance monitoring is conducted at several locations on Site, including where Woman Creek crosses Indiana Street. Pond C-1 is a flow-through retention basin and the water ultimately discharges off the Site in Woman Creek at Indiana Street (compliance monitoring station GS01) if there is adequate flow.<sup>3</sup> At GS01, plutonium and americium concentrations have been monitored since October 1996, total uranium concentrations since February 2003, and tritium concentrations from October 1996 through June 2003 (since June 2003, tritium is no longer an Analyte of Interest [AoI]). The monitoring data (DOE 2000, DOE 2001, DOE 2002) show there have never been AoIs at concentrations above the surface water standards (a "reportable value") based on 30-day running averages, which is the metric used for assessing compliance (DOE 1997).

<sup>2</sup> For surface water data recorded in SWD, approximately 10% of the data have multiple entries for a given sample and collection date. The figures in this document portray the highest concentration of these replicates. With few exceptions, the data are very similar in magnitude and SWD does not indicate that any of the replicate data have been rejected in the validation process or that some of the replicates are quality control samples. The replicate data shown in Table 4 are all valid results in SWD, however, in these cases, there is considerable variance in the replicate results.

<sup>3</sup> Flow in Woman Creek at Indiana Street is likely a mixture of Pond C-1 outflow and runoff from within the Woman Creek drainage downstream of Pond C-1.

## NFAA Summary

IHSS 142 10 is proposed for NFAA. The Subsurface Soil Risk Screen and ALs in RFCA Attachment 5 (DOE et al 2003) have been applied to the characterization data for this IHSS. The risk screen does not indicate that soil or sediment removal is necessary. Sediment contaminant concentrations are well below the WRW ALs. Data indicating concentrations above the surface water ALs appear to be spurious results. Lastly, the monitoring data for GS01 on Woman Creek at Indiana Street show there have never been analytes of interest at concentrations above the surface water standards based on 30-day running averages, which is the metric used for assessing compliance. Therefore, it is concluded that no further accelerated action is required at IHSS 142 10. Ecological effects will be evaluated in the Accelerated Action Ecological Screening Evaluation and the ecological portion of the Sitewide Comprehensive Risk Assessment. The final configuration for Pond C-1 is being determined by the Department of Energy, Kaiser-Hill, L L C, and the Fish and Wildlife Service.

## References

DOE, 1991 *Final Phase I RFI/RI Work Plan, Rocky Flats Plant Woman Creek Priority Drainage (Operable Unit No 5)*, Rocky Flats Plant, Golden, Colorado, October

DOE, 1992, *Historical Release Report for the Rocky Flats Plant*, Rocky Flats Plant, Golden, CO, June

DOE, 1993, *Background Geochemical Characterization Report*, Golden, CO, September

DOE, 1996a, *Final Phase I RFI/RI Report Woman Creek Priority Drainage, Operable Unit 5*, RF/ER-96-0012 UN, Rev 0 Rocky Flats Environmental Technology Site, Golden, CO, April

DOE, 1996b, *Final Rocky Flats Cleanup Agreement*, Department of Energy, Rocky Flats Environmental Technology Site, Golden, CO, July

DOE 1997, *Integrated Monitoring Plan Background Document*, Department of Energy, Rocky Flats Environmental Technology Site, Golden, CO, June

DOE, 2000 *RFETS Automated Surface-Water Monitoring Report Water Years 1997-2000*, Rocky Flats Environmental Technology Site, Golden, CO

DOE, 2001 *RFETS Automated Surface-Water Monitoring Report Water Year 2001*, Rocky Flats Environmental Technology Site, Golden, CO

DOE, 2002 *RFETS Automated Surface-Water Monitoring Report Water Year 2002*, Rocky Flats Environmental Technology Site, Golden, CO



DOE, CDPHE, EPA, 2003, *Modifications to the Rocky Flats Cleanup Agreement Attachment*, U S Department of Energy, Colorado Department of Public Health and Environment, and U S Environmental Protection Agency, Rocky Flats Environmental Technology Site, Golden, Colorado, June

URS, 2002 *Sampling and Analysis Plan for Characterization of Pond C-1 (IHSS 142 10)*, URS Corporation, September

Table 1 Pond C-1 Analytical Program

Location Code	Sample Type	Start Depth (FT)	End Depth (FT)	Analyte Class										
				Total Rads	Diss Rads	Total Metals	Diss Metals	VOCs	SVOCS	Pesticides	PCBs	Herbicides	Dioxins	WQP
C1	SED	0	0.5							X	X			X
CR31-000	SED	0	0.5	X		X								
CR31-001	SED	0	0.5	X		X								
CR31-002	SED	0	0.5	X		X								
CR31-003	SED	0	0.5	X		X								
CR32-001	SED	0	1*	X		X		X	X					
SED509	SED	0	0.83	X		X		X	X					X
SED509	SED	0.5	1	X										
SED510	SED	0	0.92	X		X		X	X	X	X			X
SED510	SED	0.5	1	X										
CR31-000	SED	0.5	1.5	X		X								
CR31-000	SED	1.5	2.5*	X		X								
CR31-001	SED	0.5	1.5	X		X								
CR31-001	SED	1.5	2*	X		X								
C1	SW			X <sup>1</sup>	X <sup>2</sup>	X <sup>2</sup>	X <sup>2</sup>	X <sup>2</sup>	X <sup>2</sup>	X <sup>2</sup>		X <sup>2</sup>	X <sup>2</sup>	X <sup>2</sup>

1 Greater than 100 samples were collected between 1991 and 1996

2 Less than 15 samples were collected, all in 1991

\* Sampling field notes indicate the end depth is at the base of the sediments

Table 2 Summary of Sediment Contamination at Pond C-1

Analyte	Total Number Samples Analyzed	Detection Frequency	Average Concentration	Maximum Concentration	Background Mean Plus 2SD	Wildlife Refuge Worker Action Level	Unit
Arsenic	11	55%	10.8	14.5	7.24	22.2	mg/kg
Barium	11	100%	690.8	880	188.17	26400	mg/kg
Benzoic Acid	3	67%	300.0	410	-	1000000000	ug/kg
Chromium	11	82%	40.5	45.3	23.23	268	mg/kg
Copper	11	91%	54.1	83.5	27.27	40900	mg/kg
Di-n-butylphthalate	2	50%	110.0	110	-	737000000	ug/kg
Iron	11	91%	35710.0	43400	21379.01	307000	mg/kg
Manganese	11	18%	747.0	749	659.22	3480	mg/kg
Mercury	2	100%	1.5	1.6	0.34	25200	mg/kg
Naphthalene	3	33%	2.0	2	-	3090000	ug/kg
Nickel	11	91%	39.4	49.4	17.89	20400	mg/kg
Nitrite	2	100%	1.2	1.3	0.72	102000	mg/kg
Plutonium-239/240	13	8%	1.4	1.4	1.35	50	pCi/g
Selenium	10	60%	2.8	3.93	1.55	5110	mg/kg
Strontium	11	73%	255.3	378	201.44	613000	mg/kg
Tetrachloroethene	2	50%	1.0	1	-	615000	ug/kg
Toluene	3	67%	450.0	520	-	313000000	ug/kg
Uranium-234	13	62%	8.2	13	3.98	300	pCi/g
Uranium-235	13	62%	0.5	0.59	0.15	8	pCi/g
Uranium-238	13	69%	7.7	13	3.46	351	pCi/g
Vanadium	11	82%	147.6	198	46.83	7150	mg/kg
Zinc	11	91%	139.5	176	104.4	307000	mg/kg
Above the Wildlife Refuge Worker or Ecological Receptor Action Level							

Table 3 Summary of Chemicals Above Background in Pond C-1 Surface Water

Analyte	Total Number Samples Analyzed	Detection Frequency	Maximum Concentration	Surface Water Action Level	Unit
Acetone	7	29%	45	3650	ug/L
Americium-241	261	6%	2,565	0.15	pCi/L
Barium	13	8%	0.132	0.490	mg/L
bis(2-Ethylhexyl)phthalate	10	20%	1	1.8	ug/L
Diethylphthalate	10	10%	2	5600	ug/L
Methylene chloride	17	12%	18	4.7	ug/L
Nitrite	31	10%	0.14	0.5	mg/L
Plutonium-239/240	277	13%	0.23	0.15	pCi/L
Tritium	295	2	941	20,000	pCi/L
Uranium-total	218	15%	331.9	10	pCi/L
Above the Surface Water Action Level					

**Table 4 Replicate Surface Water Results Reported in SWD for Radionuclide Samples Exceeding the Action Level**

Analyte	Sample Collection Date	Results (pCi/l)
Americium-241	12/11/93	<b>0 2834</b>
		0 01213
		0 001329
		0 001329
	4/2/94	0 00682
		<b>2 565</b>
	4/9/94	<b>0.215</b>
		0 002064
		0 01384
	1/14/95	-0 0002966
		<b>0 2041</b>
Plutonium-239/240	7/15/91	<b>0 23</b>
Uranium-total	10/10/92	<b>331 9</b>
		2 2
	10/17/92	<b>238.8</b>
		1 9

Bold face indicates concentration exceeds the Surface Water AL



**Figure 2**  
IHSS 142 10

JHSS 142 10

Sta da d M p F ature  
Stre m ditche  
dr nage fe tu

Fence d he ba  
- D oed

**DA SOURCE BASE FEATURES.**  
**PMCs**  
 Half-year Release Report (HRRR)  
 2nd Annual Update  
 Sept. 30, 1987  
 Included:  
 DOE, 1982, HRRR Report and Subsequent Updates  
 Buildings, access, hydrology, roads and other  
 structures from 1964 until 1987—now dat  
 a-bases by E&A, REL, as Vegas.  
 Published from the orthophotography, 1/95

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**IHS 142-10**

**CA31 001**

**CR31 003**

SED510

**SED508**

**CR31-000**

**CR31 002**

1 inch per sent 1 890 ppr ximat by 74 feet

Stat Plane Co rdinat Projctio  
Colo ado Central Zone  
Datum NAD27

U S Department of Energy  
Rocky Flats Environmental Technology Site

800 DENT 303-999-7707

**Prepared for**



**1**

February 12, 2004

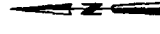
# **IHSS 142 10 Sediment Distribution of Constituents Above Background**



Fence do the ba re  
D road

Individual Hazardous Substance Sites (IHSS)  
DOE, 1992, IHR Report and Subsequent Updates.  
Buildings, fences, hydrographs, roads and other  
attractions from 1994 aerial fly-over data  
captured by ES&G RSL, as Negs.  
Digitized from the orthophotographs. 1/95

responsibility for securing complete and truthful information appears to be shared by all concerned. The fact that the FBI would not have any control rights



Scale 1 890  
1 inch represents approximately 74 feet



Colo ado Cent al Z  
Dest m NAD27

## Rocky Flats Environmental Technology Site

**Call Dept. 303-696-7707**

Prepared for



● CH2MHILL

February 12, 2004

0	1	FT	Arsenic	9.35	mg/kg	22.2	21.6	7.24
0	1	FT	Barium	764	mg/kg	26400		18817
0	1	FT	Chromium	41.4	mg/kg	268		23.23
0	1	FT	Copper	46	mg/kg	40600		27.27
0	1	FT	Iron	34200	mg/kg	307000		21379.01
0	1	FT	Naphthalene	2	ug/kg	3060000		
0	1	FT	Nickel	41.5	mg/kg	20400		17.89
0	1	FT	Tetrachloroethene	1	ug/kg	615000	37500	
0	1	FT	Uranium-235	0.27	pCi/g	8	1800	0.15
0	1	FT	Uranium-238	3.6	pCi/g	351	1600	3.46
0	1	FT	Vanadium	166	mg/kg	7150	433	46.83
0	1	FT	Zinc	121	mg/kg	307000		104.4
0	0.5	FT	Barium	769	mg/kg	26400		18817
0	0.5	FT	Chromium	41.6	mg/kg	268		23.23
0	0.5	FT	Copper	54.1	mg/kg	40600		27.27
0	0.5	FT	Iron	36000	mg/kg	307000		21379.01
0	0.5	FT	Manganese	1200	mg/kg	3460		659.22
0	0.5	FT	Nickel	34.3	mg/kg	20400	17.69	17.89
0	0.5	FT	Selenium	177	mg/kg	5110		1.55
0	0.5	FT	Strontium	214	mg/kg	813000		201.24
0	0.5	FT	Uranium-234	4.3	pCi/g	300	1800	3.98
0	0.5	FT	Uranium-235	0.2	pCi/g	8	1800	0.15
0	0.5	FT	Uranium-238	4.3	pCi/g	361	1600	3.46
0	0.5	FT	Vanadium	137	mg/kg	7150	433	46.83
0	0.5	FT	Zinc	108	mg/kg	307000		104.4

	0	0.9	F1	2068	mg/kg	26400	188 17
Berium	0	0.9	F1	190	ug/kg	1000000000	
Benzoic Acid	0	0.9	F1	110	ug/kg	79700000	
D1-7-t-butylphthalate	0	0.9	F1	1.6	mg/kg	25200	0.34
Mercury	0	0.9	F1	19.1	mg/kg	20400	17.89
Nickel	0	0.9	F1	1	mg/kg	102000	0.72
Nitrite	0	0.9	F1	390	ug/kg	31300000	128000
Toluene	0	0.9	F1		ug/kg		

0.5	1.5	F1	Arsenic	772	mg/kg	22.2	218	724
1.5	2.5	F1	Arsenic	10.2	mg/kg	22.2	218	724
0	0.5	F1	Barium	788	mg/kg	28400		18817
0.5	1.5	F1	Barium	880	mg/kg	28400		18817
1.5	2.5	F1	Barium	787	mg/kg	28400		18817
0	0.5	F1	Chromium	33.9	mg/kg	268		23.23
0.5	1.5	F1	Chromium	40.8	mg/kg	268		23.23
1.5	2.5	F1	Chromium	34.2	mg/kg	268		23.23
0	0.5	F1	Copper	51.9	mg/kg	48600		27.27
0.5	1.5	F1	Copper	51.5	mg/kg	48600		27.27
1.5	2.5	F1	Copper	50.4	mg/kg	48600		27.27
0	0.5	F1	Iron	37100	mg/kg	307000		21378.08
0.5	1.5	F1	Iron	36300	mg/kg	307000		21378.08
1.5	2.5	F1	Iron	745	mg/kg	3450		21378.08
0	0.5	F1	Manganese	417	mg/kg	20400		688.22
0.5	1.5	F1	Nickel	41.6	mg/kg	20400		17.88
1.5	2.5	F1	Nickel	41.2	mg/kg	20400		17.88
0	0.5	F1	Selenium	3.28	mg/kg	5110		1.85
0.5	1.5	F1	Selenium	2.24	mg/kg	5110		1.85
1.5	2.5	F1	Selenium	250	mg/kg	813000		207.44
0	0.5	F1	Strontium	217	mg/kg	813000		207.44
0.5	1.5	F1	Strontium	202	mg/kg	813000		207.44
1.5	2.5	F1	Strontium	5.7	pc/kg	300	1800	3.68
0	0.5	F1	Uranium-234	13	pc/kg	300	1800	3.68
0.5	1.5	F1	Uranium-234	8.7	pc/kg	300	1800	3.68
1.5	2.5	F1	Uranium-234	0.51	pc/kg	8	1800	0.15
0	0.5	F1	Uranium-235	0.44	pc/kg	8	1800	0.15
0.5	1.5	F1	Uranium-235	0.48	pc/kg	8	1800	0.15
1.5	2.5	F1	Uranium-235	8.7	pc/kg	351	1800	3.48
0	0.5	F1	Uranium-238	13	pc/kg	351	1800	3.48
0.5	1.5	F1	Uranium-238	8.7	pc/kg	351	1800	3.48
1.5	2.5	F1	Vanadium	105	mg/kg	7150	483	48.83
0	0.5	F1	Vanadium	180	mg/kg	7150	483	48.83
0.5	1.5	F1	Vanadium	148	mg/kg	7150	483	48.83
1.5	2.5	F1	Vanadium	137	mg/kg	307000		104.4
0	0.5	F1	Zinc	137	mg/kg	307000		104.4
0.5	1.5	F1	Zinc	142	mg/kg	307000		104.4
1.5	2.5	F1	Zinc	144	mg/kg	307000		104.4

0	0.5	1	Berium	648	mg/kg	26400	188.17
0	0.5	1	Chromium	44.9	mg/kg	268	28.23
0	0.5	1	Clapper	85.5	mg/kg	40800	27.27
0	0.5	1	Iron	32700	mg/kg	307998.01	371.99
0	0.5	1	Manganese	749	mg/kg	3480	688.22
0	0.5	1	Nickel	33	mg/kg	20400	17.89
0	0.5	1	Selenium	2.07	mg/kg	5110	1.85
0	0.5	1	Silicium	378	mg/kg	813000	267.24
0	0.5	1	Sulfurium-234	4.1	mg/kg	300	1.98
0	0.5	1	Sulfurium-238	4.1	mg/kg	351	3.48
0	0.5	1	Vanadium	119	mg/kg	7160	43.93
0	0.5	1	Zinc	115	mg/kg	37000	104.4

0.5	1.5	F1	Asenic	14.5	mg/kg	22.2	216	7.24
1.5	2	F1	Asenic	12.9	mg/kg	22.2	216	7.24
0	0.5	F1	Barium	857	mg/kg	28400		188.17
0.5	1.5	F1	Barium	787	mg/kg	28400		188.17
1.5	2	F1	Barium	784	mg/kg	28400		188.17
0	0.5	F1	Chromium	45.3	mg/kg	268		23.23
0.5	1.5	F1	Chromium	38.6	mg/kg	268		23.23
1.5	2	F1	Chromium	40.2	mg/kg	268		23.23
0	0.5	F1	Copper	71	mg/kg	40800		27.27
0.5	1.5	F1	Copper	69.3	mg/kg	40800		27.27
1.5	2	F1	Copper	47	mg/kg	40800		27.27
0	0.5	F1	Iron	38800	mg/kg	307000		21379.01
0.5	1.5	F1	Iron	38100	mg/kg	307000		21379.01
1.5	2	F1	Iron	34800	mg/kg	307000		21379.01
0	0.5	F1	Nickel	39.2	mg/kg	20400		17.88
0.5	1.5	F1	Nickel	46	mg/kg	20400		17.88
1.5	2	F1	Nickel	41.2	mg/kg	20400		17.88
0	0.5	F1	Selenium	3.93	mg/kg	8110		1.55
0.5	1.5	F1	Selenium	1.82	mg/kg	8110		1.55
0	0.5	F1	Selenium	3.68	mg/kg	813000		201.44
0.5	1.5	F1	Selenium	205	mg/kg	813000		201.44
1.5	2	F1	Selenium	207	mg/kg	813000		201.44
0	0.5	F1	Uranium-234	8.9	pCi/g	300	1800	3.98
0.5	1.5	F1	Uranium-234	11	pCi/g	300	1800	3.98
1.5	2	F1	Uranium-234	5.7	pCi/g	300	1800	3.98
0	0.5	F1	Uranium-235	0.48	pCi/g	8	1800	0.15
0.5	1.5	F1	Uranium-235	0.5	pCi/g	8	1800	0.15
1.5	2	F1	Uranium-235	0.47	pCi/g	8	1800	0.15
0	0.5	F1	Uranium-238	8.9	pCi/g	351	1800	3.46
0.5	1.5	F1	Uranium-238	11	pCi/g	351	1800	3.46
1.5	2	F1	Uranium-238	5.7	pCi/g	351	1800	3.46
0	0.5	F1	Vanadium	147	mg/kg	7150		48.33
0.5	1.5	F1	Vanadium	150	mg/kg	7150		48.33
1.5	2	F1	Vanadium	155	mg/kg	7150		48.33
0	0.5	F1	Zinc	152	mg/kg	307000		104.4
0.5	1.5	F1	Zinc	157	mg/kg	307000		104.4
1.5	2	F1	Zinc	135	mg/kg	307000		104.4

	0	0.5	1	10	100	1000	10000	100000	1000000
Antimony	0	0.5	1	10.1	mg/kg	22.2	216	7.24	
Barium	0	0.5	1	758	mg/kg	28400		188.17	
Bismuth	0	0.5	1	44.9	mg/kg	268		23.23	
Chromium	0	0.5	1	83.5	mg/kg	40800		27.27	
Copper	0	0.5	1	43400	mg/kg	307000		21379.01	
Iron	0	0.5	1	49.4	mg/kg	20488		17.88	
Selenium	0	0.5	1	3.44	mg/kg	5110		1.55	
Silver	0	0.5	1	215	mg/kg	813000		261.44	
Sodium	0	0.5	1	3.3	mg/kg	300	1600	3.68	
Uranium-234	0	0.5	1	0.98	mg/kg	1	1600	0.76	
Uranium-235	0	0.5	1	0.3	mg/kg	381	1600	3.48	
Uranium-238	0	0.5	1	188	mg/kg	7150	433	46.83	
Vanadium	0	0.5	1	176	mg/kg	307000		102.4	
Zinc	0	0.5	1						

0	0.8	Fl	Barkum	282	mg/kg	28,400	18,117
0	0	Fl	Sulfuric Acid	410	mg/kg	100,000,000	
0	0.8	Fl	Copper	274	mg/kg	40800	27,27
0	0.8	Fl	Iron	23600	mg/kg	307600	21378.01
0	0.8	Fl	Mercury	1.3	mg/kg	28200	0.34
0	0.8	Fl	Nickel	1.3	mg/kg	102800	0.72
0.5	1.0	Fl	Potassium-232-240	1.4	mg/kg	50	1.35
0	0.8	Fl	Toluene	820	mg/kg	31300000	128000
0	0.8	Fl	Zinc	108	mg/kg	307600	104.4



Figure 4

IHSS 142.10 Surface Water  
Distribution of Constituents  
Above Background

EXPLANATION

IHSS 142.10

Exceeds Surface Water Action Level

Standard Map Features  
Streets, ditches, etc.  
Fence, railroad, etc.

Ditch  
Road

DATA SOURCE BASE FEATURES  
Topographic Map (1980)  
Aerial Photograph (1980)  
Digital Data (1980)  
DOE, 1982, 1988 Report and Supplemental Data  
DOE, 1982, 1988 Report and Supplemental Data  
DOE, 1982, 1988 Report and Supplemental Data  
DOE, 1982, 1988 Report and Supplemental Data

DOE, 1982, 1988 Report and Supplemental Data  
DOE, 1982, 1988 Report and Supplemental Data  
DOE, 1982, 1988 Report and Supplemental Data  
DOE, 1982, 1988 Report and Supplemental Data

Scale 1:880  
1 inch represents approximately 74 feet



State Plane Coordinate System  
Colorado Central Zone  
Datum NAD27

U.S. Department of Energy  
Rocky Flats Environmental Technology Site

Prepared by

Prepared for



CH2M HILL

February 12, 2004

Acetone	45	ug/L	3650
Acetone	45	ug/L	3650
Americium-241	0.108	pCi/L	0.15
Americium-241	0.111	pCi/L	0.15
Americium-241	0.02332	pCi/L	0.15
Americium-241	0.024	pCi/L	0.15
Americium-241	0.043	pCi/L	0.15
Americium-241	0.02069	pCi/L	0.15
Americium-241	0.02643	pCi/L	0.15
Americium-241	0.06448	pCi/L	0.15
Americium-241	0.02458	pCi/L	0.15
Americium-241	0.06411	pCi/L	0.15
Americium-241	0.07572	pCi/L	0.15
Americium-241	0.03729	pCi/L	0.15
Barium	0.132	mg/L	0.49
Bis(2-Ethylhexyl)phthalate	1	ug/L	1.8
Bis(2-Ethylhexyl)phthalate	1	ug/L	1.8
Dibutylphthalate	2	ug/L	5000
Nitrite	0.06	mg/L	0.4346
Nitrite	0.07	mg/L	0.4346
Nitrite	0.14	mg/L	0.4346
Plutonium-239/240	0.022	pCi/L	0.15
Plutonium-239/240	0.039	pCi/L	0.15
Plutonium-239/240	0.021	pCi/L	0.15
Plutonium-239/240	0.058	pCi/L	0.15
Plutonium-239/240	0.024	pCi/L	0.15
Plutonium-239/240	0.042	pCi/L	0.15
Plutonium-239/240	0.034	pCi/L	0.15
Plutonium-239/240	0.024	pCi/L	0.15
Plutonium-239/240	0.126	pCi/L	0.15
Plutonium-239/240	0.022	pCi/L	0.15
Plutonium-239/240	0.026	pCi/L	0.15
Plutonium-239/240	0.035	pCi/L	0.15
Plutonium-239/240	0.037	pCi/L	0.15
Plutonium-239/240	0.031	pCi/L	0.15
Plutonium-239/240	0.021	pCi/L	0.15
Plutonium-239/240	0.02489	pCi/L	0.15
Plutonium-239/240	0.02574	pCi/L	0.15
Plutonium-239/240	0.02295	pCi/L	0.15
Plutonium-239/240	0.023	pCi/L	0.15
Plutonium-239/240	0.02201	pCi/L	0.15
Plutonium-239/240	0.03268	pCi/L	0.15

IHSS 142.10

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